



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Northeast Regional Office • 205B Lowell Street, Wilmington MA 01887 • 978-694-3200

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

April 12, 2016

Ms. Cheri R. Cousens, P.E.
Executive Director
Greater Lawrence Sanitary District
240 Charles Street
North Andover, MA 01845

RE: NORTH ANDOVER
Transmittal No.: X268418
Application No.: NE-15-017
Class: *SM80-7*
FMF No.: 178581
AIR QUALITY PLAN APPROVAL

Dear Ms. Cousens:

The Massachusetts Department of Environmental Protection ("MassDEP"), Bureau of Waste Prevention, has reviewed your Non-major Comprehensive Plan Application ("Application") listed above. This Application concerns the proposed construction and operation of a modified anaerobic gas digestion system, two (2) new combined heat and power engines, and a new enclosed flare at your wastewater treatment facility located at 240 Charles Street in North Andover, Massachusetts ("Facility"). The Application bears the seal and signature of Mr. Benjamin R. Mosher, Massachusetts Registered Professional Engineer Number 46394.

This Application was submitted in accordance with 310 CMR 7.02 Plan Approval and Emission Limitations as contained in 310 CMR 7.00 "Air Pollution Control" regulations adopted by MassDEP pursuant to the authority granted by Massachusetts General Laws, Chapter 111, Section 142 A-N, Chapter 21C, Section 4 and 6, and Chapter 21E, Section 6. MassDEP's review of your Application has been limited to air pollution control regulation compliance and does not relieve you of the obligation to comply with any other regulatory requirements.

MassDEP has determined that the Application is administratively and technically complete and that the Application is in conformance with the Air Pollution Control regulations and current air pollution control engineering practice, and hereby grants this **Plan Approval** for said Application, as submitted, subject to the conditions listed below.

Please review the entire Plan Approval, as it stipulates the conditions with which the Facility owner/operator ("Permittee") must comply in order for the Facility to be operated in compliance with this Plan Approval.

1. DESCRIPTION OF FACILITY AND APPLICATION

The Greater Lawrence Sanitary District (GLSD) Wastewater Treatment Plant (Facility) began operation in 1977 to treat an average annual flow of 52 million gallons per day (mgd) of wastewater from five communities in northern Massachusetts and southern New Hampshire. In 2002, GLSD commenced operation of the bio-solids processing train, a bio-solids drying and pelletizing facility and digester gas boilers for the purpose of heating the anaerobic digesters and space heating for the Facility.

The purpose of this plan application submittal by GLSD is to propose an Organics to Energy Project (Project) to expand the existing anaerobic digestion system at its Facility to allow for co-digestion of source separated organics (SSO) and wastewater bio-solids. The resulting increase in biogas production will be used to fuel a new combined heat and power (CHP) system.

The Project will improve the resiliency and reduce operating costs of the Facility, and greatly reduce the GLSD's reliance on utility-supplied power while maximizing benefits to the member communities. With this in mind, GLSD is proposing to expand its current Facility by adding the following emissions units (EUs), pollution control devices (PCDs), and infrastructure: **a new Source Separated Organics (SSO) Receiving and Storage System; a new Anaerobic Digester Tank and Ancillary Digestion Equipment; Upgraded Biogas Collection, Flare and Safety Equipment; and two new Combined Heat and Power (CHP) Engines.**

New Source Separated Organics (SSO) Receiving and Storage System

This system has been sized to accommodate 240,000 gallons (approximately 2.5 days of storage capacity at full receiving rates). The two new tanks, 120,000 gallons each, with dimensions of 35-ft x 35-ft x 13-ft liquid depth, will be located adjacent to Tunnel V. The supporting pumped mix system and SSO transfer pumps will be installed within Tunnel V. The SSO will be transferred from the new tanks to the existing blend tank, where it would be combined with the existing thickened primary and secondary sludge before being fed to the anaerobic digestion system.

The headspace for the two proposed SSO receiving tanks (Emission Unit Nos. 20 and 21) will be connected and vented into the existing odor control system fans and the existing in-ground biofilter system (PCD-3) at the site. These odor control system fans and this biofilter system have been evaluated to determine whether or not improvements are necessary to treat the additional flow of odorous air from the proposed new SSO receiving tanks. The conclusion is that PCD-3, which consists of a 12,000-standard cubic feet per minute (scfm) fan and biofilter, will be able to accommodate the additional exhaust air from two new organic waste storage

tanks, if the existing duct system is rebalanced to reduce air withdrawal rates about 10 to 12.5%.

GLSD requires that the SSO provided by its haulers meet certain specifications such as contamination, solids content, chemical oxygen demand, oil and grease, pH, and metals to prevent issues within the anaerobic digestion system. The contracted haulers will conduct all pre-processing of SSO off-site prior to delivery.

New Anaerobic Digester Tank and Ancillary Digestion Equipment

A fourth anaerobic digester (AD) (Emission Unit No. 25) is proposed to be installed in the location that was reserved for this expansion as part of the original digestion facility design. This new cast-in-place concrete tank will have a total volume of approximately 1.52 million gallons, and provide an additional 1.4 million gallons (MG) of digestion volume. This tank will be provided with a floating gas holding cover and draft tube mixers, similar to the other three existing units (Emission Unit Nos. 22, 23, and 24). Additionally, a new 1.7 million British thermal units per hour (MMBtu/hr) heat exchanger and new recirculation pumps will be required to maintain mesophilic temperatures in the tank.

Upgraded Biogas Collection, Flare and Safety Equipment

Due to the significant increase in biogas or digester gas production resulting from SSO processing, the existing biogas conveyance, safety and flare systems are proposed to be expanded. New collection headers, condensate traps, conveyance pipelines, and a new, fully enclosed waste gas burner system, all sized to handle the additional gas production, are included in the Project.

The biogas produced by the AD operation, both from the existing three digesters and from the new fourth digester, will be compressed to five pounds per square inch (psi) and will have excess water removed before entering the two proposed engine/generator sets.

The proposed new enclosed flare (Emission Unit No. 17) will have a maximum energy input rating of 33 million British thermal units per hour (MMBtu/hr) and will be capable of firing approximately 1,000 standard cubic feet per minute (scfm) of biogas having an approximate fuel heat content of 550 British thermal units per standard cubic feet (Btu/scf). The new 1,000-scfm enclosed flare which will have turndown ratio of 10:1, together with the existing Varec Model 249 Series enclosed flare, will have the capacity to capture and combust the entire volume of biogas produced by the digesters in an emergency scenario. Emission Unit No. 17 will be used first to combust any biogas not used by combustion equipment at the site, followed by the existing enclosed flare, if needed.

It is estimated that the thermal destruction efficiency for volatile organic compounds (VOC) will be a minimum of 99 percent. The flare will use natural gas to pre-heat the combustion chamber to the required minimum operating temperature prior to the introduction of the digester gas, and to provide a pilot flame.

A thermocouple will be located at the downstream end of the effective combustion chamber volume. The exit of the enclosed flare will have an inside diameter of 9.13 feet and an exhaust height of 31 feet above ground level. The exhaust gas exit velocity from the new flare will be about 20 feet per second at a stack gas temperature of approximately 800°F.

New Combined Heat and Power (CHP) Engines

Two proposed new reciprocating internal combustion engines (Emission Unit Nos. 18 and 19) with combined heat and power capabilities, each with a power generation capacity of approximately 1,560 kilowatts (kW), will be housed in a proposed new cogeneration building located southwest of the digestion complex. These biogas-fueled engines will provide the majority of the GLSD's power needs at its main treatment facility. The engine generator sets will also provide back-up power to the main treatment plant in the event of a power outage. The exhaust from the CHP engine generator sets will generate heat that will be used to warm the contents of the AD's via an expansion of the existing glycol heating loop. Heat will be captured from the engine block as well as the exhaust.

The two (2) new proposed CHP engines will be Caterpillar Model No. CG170-16 spark-ignited engines, or equivalent, each having a maximum heat input capacity of 12.87 MMBtu/hr. Each engine will be capable of combusting up to 390 scfm of digester gas at 100% load. Digester gas containing approximately 550 Btu/scf of biogas will serve as the primary fuel for these engines. These "lean-burn" engines will also be capable of firing natural gas, which will be used during initial commissioning, startup and/or as necessary to optimize the operation of the engines.

Each engine will be equipped with an oxidation catalyst (OC) (PCD-2A and PCD-2B) for carbon monoxide (CO) control and volatile organic compounds (VOC) removal, and selective catalytic reduction (SCR) (PCD-1A and PCD-1B) for nitrogen oxides (NO_x) removal to provide Best Available Control Technology (BACT). Each SCR system will reduce the NO_x emanating from its associated engine by 98.2 percent by weight (%) while each OC system will reduce the VOC and CO by 50% and 96.1% by weight, respectively.

Each CHP engine will be equipped with a critical grade muffler which will be connected to a 20-inch diameter vertical exhaust stack. The opening of these vertical stacks will be situated 30.8 feet above ground level. The exhaust gas exit velocity from each engine stack will be about 46 feet per second at a stack gas temperature of approximately 300°F.

New Biogas Treatment System

Sulfates are present in wastewater, and are converted to hydrogen sulfide (H_2S) gas by the anaerobic bacteria in the digesters. H_2S is a contaminant in the predominantly methane biogas, and is corrosive to equipment, such as cogeneration engines and boilers. Ferric chloride is currently added to the GLSD digesters to remove H_2S and to reduce H_2S concentrations below 140 parts per million by volume (ppmv) and to control struvite formation. However, to further improve H_2S removal from the GLSD biogas, a system of four fixed media scrubbers containing iron sponge material (PCD-4) will be provided upstream of the proposed engines, existing boilers, and existing biosolids drying facility. The iron sponge treatment efficiency will be monitored by online H_2S meters located up- and downstream of the treatment system. Though a site-specific operations plan has yet to be developed for this system, the media will generally be changed out when the discharge H_2S concentration approaches 5 ppmv, or after two years of media life, whichever occurs first. The biogas treatment train will also include a siloxane removal (PCD-5) system through the use of a carbon substrate to protect the engines and SCR equipment from glassy residue build-up. A final particulate filter (PCD-6) will complete the biogas treatment train.

EXISTING EQUIPMENT and PROCESSES:

The District's treatment facility currently provides secondary treatment that includes screenings and grit removal, primary clarification, biological treatment, secondary clarification and chlorination followed by dechlorination of the wastewater prior to discharge to the Merrimack River.

Sludge from the primary and secondary clarification tanks are collected separately for further processing. Settled primary sludge is pumped to the gravity thickeners for additional thickening, whereas settled secondary sludge is pumped to gravity belt thickeners for the same purpose. The gravity belt thickener may also be used to thicken combined primary and secondary sludges. Oil and greased skimmed from the clarifiers is collected and concentrated before being added to the sludge blend tanks. The mixture of sludges and oil and grease is continuously mixed prior to conveyance to the three existing 1.4 million gallon anaerobic digesters (AD). Following digestion the sludge is conveyed to two high-solids centrifuges that thicken digested solids prior to transport to the on-site biosolids drying facility.

The existing energy systems at the GLSD facility utilize a combination of biogas, natural gas, purchased electricity and solar energy. The systems which currently utilize biogas or a combination of biogas and natural gas include boilers for digester heating, steam boilers for facility space heating demand, the biosolids drying facility, and the existing waste gas burner (flare).

Existing Digester Gas Boilers

There are three identical Burnham Model No. 4FWH-993-50-GG-GP boilers (Emission Unit Nos. 1, 2, and 3), each having a maximum energy input capacity of 8.31 MMBtu/hr. These emission units use biogas as their primary fuel, with natural gas as an auxiliary fuel. These boilers provide heat to the digester tanks and to the facility buildings. Only two of the three digester boilers may be used at any given time, with the third unit acting as a standby boiler.

Existing Building Heat Boilers

GLSD utilizes two Weil McLain Model No. 1088 boilers (Emission Unit Nos. 15 and 16), installed in 2011, each having a maximum heat input rating of 2.87 MMBtu/hr to provide space heating for non-process buildings. These boilers use biogas as their primary fuel, and natural gas as an auxiliary fuel.

In addition, GLSD uses a Weil McLain Model No. 94 boiler (Emission Unit No. 12), installed in 1977, with a maximum heat input rating of 7.21 MMBtu/hr to provide heat to the Process Building. A second identical natural gas-fired Weil McLain boiler (Emission Unit No. 13) is a back-up unit. The process controls allow only one of these two boilers to operate at any given time. These Process Building boilers utilize only natural gas.

Existing Emergency Standby Diesel Engine/Generator Set

GLSD has a 250 kilowatt (kW) Cummins emergency engine/generator set (Emission Unit No. 8). This engine/generator set is only used for maintenance exercising, and for emergencies such as when utility power is lost. EU 8 currently only utilizes diesel fuel with a maximum sulfur content of less than or equal to 500 parts per million (ppm), but on and after July 1, 2018, shall only utilize diesel fuel with a maximum sulfur content of less than or equal to 15 ppm.

Existing Biosolids Drying Facility

The Biosolids Drying Facility consists of two dryer trains, each with its own rotary drum system, raw material handling system, product handling system and process air handling system with associated air pollution control equipment. The two Baker-Rullman SD 85-2 rotary drum dryers (Emission Unit Nos. 4 and 5) each have a maximum energy input rating of 15 MMBtu/hr. These dryers use biogas as the primary fuel and natural gas as the secondary fuel. The combustion air for the two dryers is drawn from the air in the main process room, thus creating negative pressure and minimizing the release of odors from this area.

Although each rotary drum dryer is rated at 15 MMBtu/hr, in practice they cannot be operated at an energy input rate above approximately 10 MMBtu/hr, due to the dryer system's limited ability to process solids through the dryer.

The rotary drum dryers each have a separate furnace section and rotating drum section, the latter having a triple-pass design and which brings the mixed biosolids dryer feed into direct contact with the combustion gases from the furnace. The tumbling action of the biosolids in each drum creates contact with the hot gases, evaporating much of the water and resulting in a pelletized product.

The two dryers have two identical raw material handling systems which transport dewatered, anaerobically digested biosolids from the GLSD wastewater treatment system into the two rotary drum dryers. The digested biosolids are delivered to the Biosolids Drying Building from the digester/centrifuge process via the Dewatered Biosolids Cake Conveyor. This conveyor then deposits the cake into two 1,800-cubic-foot-capacity Biosolids Cake Storage Bins. Bin Screws located at the bottoms of each storage bin are used to meter the biosolids onto each of the two Feed Biosolids Conveyors, which weigh the biosolids while transporting them to each of the two Dryer Feed Mixers. The two mixers combine the biosolids cake with recycled product from the two rotary drum dryers to generate an approximately 68% solids dryer feed. The recycled product consists of fines, crushed over-sized product, and product that was not initially collected by the Product Handling Systems described below. Two Dryer Feed Conveyors take the material exiting the mixers and introduce it into each rotary drum dryer, downstream of the furnace combustion gases.

The product exiting the rotary drum dryers is pelletized biosolids (pellets), having moisture content between 2 percent and 10 percent. The pellets and associated process air then enter into a cyclone separator (PCD-7), which will separate the product from the process air stream. The pellets exit through an air lock to be deposited on the Vibrating Screen where they are sorted for size. The oversized pellets are crushed and combined with the undersized pellets and, if necessary, with a portion of the product in the Recycle Bin. The remaining product is then indirectly cooled in the Product Cooler using plant water to remove the heat. This cooler also acts as a storage hopper for the Pneumatic Transporter, which transfers the product to each of the

two Product Storage Silos. The pellets are transferred from the silos to a dust suppression mixer where dust suppression oil is applied. The oil-treated pellets are then dropped into the bed of a waiting truck. A truck scale will be used to prevent the overloading of the trucks. On average, two truckloads of pellets are generated each day.

The process gases exit the rotary drum and enter the cyclone separator (PCD-7). The process gases then enter an Emtrol Model 66W60 3-stage impingement tray scrubber/condenser (PCD-8), which performs five functions: 1) condenses moisture out of the process gases, 2) provides hot water to the digester system (heat recovery), 3) removes 94.8 percent of total particulate matter, 4) removes 98 percent of the ammonia through reaction with the sulfuric acid being added to the scrubbing fluid, and 5) removes modest amounts of NO_x and sulfur dioxides (SO_x).

Part of the exhaust gases from the scrubber/condenser are recycled back into the furnace portion of the rotary drum dryer while the remainder of the exhaust gases enter the Emtrol Model 18/42 W20 venturi scrubber (PCD-9). This second scrubber unit provides additional particulate removal from the process gases before these gases enter one of the two Adwest Model Retox 4.0 RTO 95 regenerative thermal oxidizers (RTO) (PCD-10 and PCD-11). Each RTO thermally oxidizes contaminants in the process gas stream exiting from the dryer system re-circulating process air loop. The main contaminants being controlled are VOC and CO. The minimal thermal destruction efficiency for VOC is 98.0 percent by weight and the minimal thermal destruction efficiency for CO is 90.5 percent by weight. Each RTO utilizes either biogas or natural gas.

The maximum heat input rate for each RTO burner is 326,700 British thermal units per hour. The minimum residence time in the 1600°F temperature zone is 0.44 seconds. Each RTO utilizes a separate stainless steel exhaust stack having an exit height of 100 feet above ground level and an inside exit diameter of 1.5 feet. The exhaust gases exit vertically at a maximum temperature of 200°F and at a maximum velocity of 47 feet per second.

Existing Enclosed Thermal Flare System

GLSD currently operates an enclosed flare to control the digester gases that by-pass the above described digester gas boilers and Biosolids Drying Facility. The enclosed thermal flare (Emission unit No. 11) is a Varec Model 249 Series unit, having a maximum energy input rating of 28.8 MMBtu/hr for a biogas containing approximately 600 Btu/scf. The thermal destruction efficiency for VOC is a minimum of 99 percent or a maximum VOC outlet concentration of 20 ppmv (as hexane) at 3 percent oxygen. The flare uses natural gas to pre-heat the combustion chamber to the required minimum operating temperature of 1600°F prior to the introduction of the digester gas, and to provide a pilot flame.

EU 11 has an effective combustion chamber length of 44.58 feet, which provides a residence time of 1.06 seconds at an operating temperature of 1,600°F. A thermocouple is located at the downstream end of the effective combustion chamber volume. The exit of the enclosed flare has an inside diameter of 5.27 feet and an exhaust height of 50 feet above ground level.

Applicable Federal Regulations

The Project may be subject to 40 CFR 60 Subpart JJJJ – Federal New Source Performance Standards (NSPS) for Spark Ignition Internal Combustion Engines and 40 CFR 63 Subpart ZZZZ – Federal National Emissions Standards for Hazardous Air Pollutants (NESHAPs) for Stationary Reciprocating Internal Combustion Engines (RICE). Since MassDEP has not accepted delegation for Subpart JJJJ and Subpart ZZZZ for sources which are not subject to 310 CMR Appendix C, the Permittee is advised to consult with EPA Region 1 at 5 Post Office Square, Suite 100, Boston, MA 02109-3912, telephone: (617) 918-1111. Other applicable requirements may include notification, record keeping, and reporting requirements.

2. EMISSION UNIT IDENTIFICATION

Each Emission Unit (“EU”) identified in Table 1 is subject to and regulated by this Plan Approval:

Table 1			
EU#	Description	Design Capacity	Pollution Control Device (PCD)
EU 17	Proposed Varec Model 244E Enclosed Digester Gas Flare, or equivalent	1,000 scfm maximum biogas inlet flow rate (will provide 33.0 MMBtu/hr at 550 Btu/scf)	None
EU 18	Proposed Caterpillar Model No. CG170-16 CHP Engine, or equivalent	12.87 MMBtu/hr	SCR (PCD-1A) and Oxidation Catalyst (PCD-2A)
EU 19	Proposed Caterpillar Model No. CG170-16 CHP Engine, or equivalent	12.87 MMBtu/hr	SCR (PCD-1B) and Oxidation Catalyst (PCD-2B)
EU 20 EU 21	Two (2) Proposed SSO Feedstock Tanks	120,000 Gallons each	Biofilter (PCD-3)

Table 1			
EU#	Description	Design Capacity	Pollution Control Device (PCD)
EU 25	Proposed Anaerobic Digester Tank	1.4 Million Gallons each	Iron Sponge H ₂ S removal system (PCD-4)
EU 22 EU 23 EU 24	Three (3) Existing Anaerobic Digester Tanks		Siloxane scrubbers (PCD-5)
			Particulate Filter (PCD-6)
EU 1 EU 2 EU 3	Three (3) Existing glycol digester heating boilers (Burnham Model No. 4FWH-993-50-GG-GP)	8.31 MMBtu/hr each	None
EU 4	Existing bio-solids drying/pelletizing Train No. 1	15.0 MMBtu/hr	Cyclone separator (PCD-7) Emtrol Model 66W60 3-stage impingement tray scrubber/condenser (PCD-8) Emtrol Model 18/42 W20 scrubber/condenser (PCD-9) RTO No. 1 Adwest Retox 4.0 RTO 95 (PCD-10)
EU 5	Existing bio-solids drying/pelletizing Train No. 2	15.0 MMBtu/hr	Cyclone separator (PCD-7) Emtrol Model 66W60 3-stage impingement tray scrubber/condenser (PCD-8) Emtrol Model 18/42 W20 scrubber/condenser (PCD-9) RTO No. 2 Adwest Retox 4.0 RTO 95 (PCD-11)
EU 8	Existing 250 kW Cummins emergency engine	250 kW output	None
EU 11	Existing Varec Model 249 Series enclosed flare	800 scfm maximum biogas inlet flow rate (will provide 28.8 MMBtu/hr at 600 Btu/scf)	None
EU 12 EU 13	Two (2) Existing Process Building boilers (Weil McLain Model No. 94)	7.21 MMBtu/hr	None

Table 1			
EU#	Description	Design Capacity	Pollution Control Device (PCD)
EU 15 EU 16	Two (2) Existing Facility steam heat boilers (Weil McLain Model No. 1088)	2.87 MMBtu/hr each	None

Table 1 Key:

EU# = Emission Unit Number

MMBtu/hr = million British thermal units per hour

kW = kilowatts

SSO = source separated organics

RTO = regenerative thermal oxidizer

Btu/scf = British thermal units per standard cubic feet

PCD = Pollution Control Device

CHP = combined heat and power

MW = megawatts

SCR = selective catalytic reduction

scfm = standard cubic feet per minute

3. **APPLICABLE REQUIREMENTS**

A. **OPERATIONAL, PRODUCTION and EMISSION LIMITS**

The Permittee is subject to, and shall not exceed the Operational, Production, and Emission Limits as contained in Table 2:

Table 2			
EU#	Operational / Production Limit	Air Contaminant	Emission Limit
EU 17	Biogas fuel Natural gas auxiliary fuel	NO _x	1.98 lbs/hr 8.67 TPY
		VOC ^a	1.07 lbs/hr 4.69 TPY
		SO ₂	1.40 lbs/hr 6.13 TPY

Table 2			
EU#	Operational / Production Limit	Air Contaminant	Emission Limit
EU 17	Biogas fuel	PM	1.65 lbs/hr 7.23 TPY
	Natural gas auxiliary fuel	CO	9.90 lbs/hr 43.36 TPY
EU 18 EU 19 ^b	Biogas primary fuel Natural gas secondary fuel	NO _x (after approximately 98% control efficiency by weight)	0.48 lbs/hr total 0.62 TPM total 2.10 TPY total 0.15 lbs/MWh
		VOC (after approximately 50% control efficiency by weight)	4.62 lbs/hr total 4.3 TPM total 20.24 TPY total 1.48 lbs/MWh
		SO ₂ ^c	0.04 lbs/hr total 0.015 TPM total 0.18 TPY total 0.013 lbs/MWh
		PM	0.10 lbs/hr total 0.04 TPM total 0.44 TPY total 0.032 lbs/MWh
		CO (after approximately 96% control efficiency by weight)	3.12 lbs/hr total 1.7 TPM total 13.67 TPY total 1.0 h lbs/MW

Table 2			
EU#	Operational / Production Limit	Air Contaminant	Emission Limit
EU 18 EU 19 ^b	Biogas primary fuel Natural gas secondary fuel	NH ₃	0.18 lbs/hr per SCR 10 ppmvd @ 15% O ₂ per SCR 0.07 TPM total 0.82 TPY total
EU 22 EU 23 EU 24 EU 25	N/A	H ₂ S	≤ 140 ppmv after ferric chloride (addition to digesters) ≤ 5 ppmv after Iron Sponge H ₂ S Control System (PCD-4)
EU 1 EU 2 EU 3	Biogas primary fuel	NO _x	0.562 lbs/hr total
	Natural gas secondary fuel		0.21 TPM total
	Restriction on fuel usage		1.36 TPY total
	<ul style="list-style-type: none"> • ≤ 17,160,000 cubic feet of biogas in any given month or • ≤ 12,800,000 cubic feet of natural gas in any given month or • ≤ 17,160,000 cubic feet of any combination of the two fuels in any given month • ≤ 106,900,000 cubic feet of biogas, natural gas, or any combination of the two fuels over any consecutive twelve month rolling period 	VOC	0.155 lbs/hr total 0.06 TPM total 0.31 TPY total
		SO ₂ ^d	0.743 lbs/hr total 0.28 TPM total 1.72 TPY total
		PM	0.175 lbs/hr total 0.07 TPM total 0.40 TPY total
	Only 2 boilers may be running at any given time	CO	0.40 lbs/hr total 0.15 TPM total 0.80 TPY total

Table 2			
EU#	Operational / Production Limit	Air Contaminant	Emission Limit
EU 4 EU 5	Biogas primary fuel	NO _x ^e (after 94.5 % control efficiency by weight)	2.40 lbs/hr total
	Natural gas secondary fuel		0.875 TPM total
	Restrictions on fuel usage		10.5 TPY total
	<ul style="list-style-type: none"> • ≤ 25,143,000 cubic feet of biogas in any given month or • ≤ 15,087,000 cubic feet of natural gas in any given month or • ≤ 25,143,000 cubic feet of any combination of the two fuels in any given month 	VOC ^f (after 98.0 % control efficiency by weight)	0.44 lbs/hr total 0.161 TPM total 1.93 TPY total
	<ul style="list-style-type: none"> • ≤ 301,500,000 cubic feet of biogas over any consecutive twelve month rolling period, or • ≤ 180,930,000 cubic feet of natural gas over any consecutive twelve month rolling period or • ≤ 301,500,000 cubic feet of any combination of the two fuels over any consecutive twelve month rolling period 	SO ₂ ^d	2.6 lbs/hr total 0.95 TPM total 11.4 TPY total
		PM ^g (after 98.1 % control efficiency by weight)	1.28 lbs/hr total 0.465 TPM total 5.58 TPY total
		CO ^h (after 90.5 % control efficiency by weight)	1.78 lbs/hr total 0.647 TPM total 7.76 TPY total
		Arsenic	5.68 x 10 ⁻⁵ lbs/hr
		Cadmium	3.59 x 10 ⁻⁴ lbs/hr
		Opacity	<5% at any time during normal operations
EU 8	Diesel Fuel Only ≤ 300 operating hours in any consecutive 12 month period	Sulfur in Fuel ⁱ	≤ 500 ppm Sulfur content through June 30, 2018 ≤ 15 ppm Sulfur content on and after July 1, 2018

Table 2			
EU#	Operational / Production Limit	Air Contaminant	Emission Limit
EU 11	Biogas fuel Natural gas auxiliary fuel Twelve Month Rolling Fuel Restriction $\leq 258,720,000$ cubic feet of biogas over any consecutive twelve month rolling period Minimum operating temperature of 1600 °F	NO _x	3.46 lbs/hr 9.32 TPY
		VOC	2.42 lbs/hr 6.52 TPY
		SO ₂ ^d	3.78 lbs/hr 10.19 TPY
		PM	1.74 lbs/hr 4.69 TPY
		CO	10.40 lbs/hr 28.03 TPY
EU 12 EU 13	<u>Natural gas only</u>	NO _x	0.58 lbs/hr 2.54 TPY
		VOC	0.03 lbs/hr 0.14 TPY
		SO ₂	0.005 lbs/hr 0.02 TPY
		PM	0.01 lbs/hr 0.05 TPY
		CO	0.49 lbs/hr 2.15 TPY
EU 15 EU 16	Biogas primary fuel Natural gas secondary fuel	NO _x	0.56 lbs/hr total 2.45 TPY total
		VOC	0.03 lbs/hr total 0.13 TPY total
		SO ₂ ^c	0.003 lbs/hr total 0.02 TPY total

Table 2			
EU#	Operational / Production Limit	Air Contaminant	Emission Limit
EU 15 EU 16	Biogas primary fuel Natural gas secondary fuel	PM	0.01 lbs/hr total 0.05 TPY total
		CO	0.47 lbs/hr total 2.06 TPY total
Facility-wide	N/A	NO _x	3.1 TPM 37.1 TPY
		VOC	2.9 TPM 34.0 TPY
		SO ₂	2.5 TPM 29.6 TPY
		PM	1.5 TPM 18.4 TPY
		CO	8.2 TPM 97.9 TPY
		HAP (total)	0.83 TPM 9.9 TPY
		Opacity	<5%, EXCEPT 5 TO <10% FOR ≤2 MINUTES DURING ANY ONE HOUR
		Smoke	310 CMR 7.06(1)(a)

Table 2 Key:

EU# = Emission Unit Number

CO = Carbon Monoxide

PM = Total Particulate Matter including PM₁₀ and PM_{2.5}

PM₁₀ = Particulate Matter less than or equal to 10 microns in diameter

PM_{2.5} = Particulate Matter less than or equal to 2.5 microns in diameter

H₂S = Hydrogen Sulfide

HAP (total) = total Hazardous Air Pollutants

TPM = tons per month

TPY = tons per consecutive 12-month period

Lbs/MWh = pounds per megawatt hour

NO_x = Nitrogen Oxides

SO₂ = Sulfur Dioxide

CO₂ = Carbon Dioxide

VOC = Volatile Organic Compounds

NH₃ = Ammonia

lbs/hr = pounds per hour

ppmv = parts per million by volume

ppmvd = parts per million by volume dry

N/A = not applicable

% = percent
°F = degrees Fahrenheit

≤ = less than or equal to
< = less than

Table 2 Notes

- ^a VOC emission rates based on 99 percent destruction and removal efficiency.
- ^b These emission limitations shall apply to all engine/generator loads, except for start-up and shutdown. Compliance with these emission limitations shall be determined based on one-hour averages. These emission limits are based upon biogas containing 550 British thermal units per standard cubic foot.
- ^c H₂S emissions are regulated by restricting the inlet H₂S concentrations to the engines to less than or equal to 5 ppm by volume after the iron sponge H₂S control system.
- ^d Sulfur dioxide emission rates based on a maximum biogas sulfur or hydrogen sulfide content of 0.019 percent by weight.
- ^e The NO_x control efficiency is not due to thermal destruction in the RTO, but is the result of applying low-NO_x burner technology in the dryers and ammonia scrubbing in the 3-stage impingement tray scrubbers/condensers with acid addition.
- ^f The VOC emissions are based upon an emission rate of no more than 25 parts per million or 98.0% thermal destruction efficiency. The term VOC refers to total non-methane hydrocarbons and is defined in the U.S. EPA Reference Method.
- ^g The PM control efficiency is not due to thermal destruction in the RTO, but the result of the use of the 3-stage impingement tray scrubbers/condensers and the venturi scrubber.
- ^h The CO emissions are based upon an emission rate of no more than 50 parts per million or a 90.5% thermal destruction efficiency.
- ⁱ Sulfur in Fuel requirements come from 310 CMR 7.05(1)(a)1.

B. COMPLIANCE DEMONSTRATION

The Permittee is subject to, and shall comply with, the monitoring, testing, record keeping, and reporting requirements as contained in Tables 3, 4, and 5:

Table 3

EU#	Monitoring and Testing Requirements
EU 18 EU 19	<p>1. The Permittee shall conduct a noise survey, which is in accordance with MassDEP guidelines, to demonstrate that the noise impacts from the operation of these EUs are in compliance with Regulation 310 CMR 7.10 and the Bureau of Waste Prevention's Noise Policy No. 90-001 (copy attached). This survey shall be conducted within 45 days of the commencement of continuous operation of these EUs. The noise survey results shall be submitted to MassDEP's Northeast Regional Office (NERO), in writing, attention BAW Permit Chief, within 75 days of the commencement of continuous operation of these EUs.</p>
	<p>2. The Permittee shall conduct emissions testing for NO_x, CO, VOC, SO₂, PM, NH₃, and CO₂ within 90 days of the commencement of continuous operation of the engines. An additional emissions test shall be conducted by no later than (3 years from initial emissions test). All compliance testing shall be conducted in accordance with the test methods and procedures set forth in 40 CFR 60, Appendix A. All compliance testing shall be witnessed by MassDEP personnel at a mutually agreeable date and time. The Permittee shall submit a test protocol for the required emission test for review and MassDEP approval at least 30 days prior to the anticipated date of testing. The Permittee shall submit the emission test results report to MassDEP's NERO within 60 days of completion of the compliance stack testing.</p>
	<p>3. For compliance testing purposes, each EU shall be constructed so as to accommodate the emissions testing requirements as stipulated in 40 CFR Part 60, Appendix A. The two (2) inlet and two (2) outlet sampling ports should ideally be located at two duct diameters upstream and eight duct diameters downstream of any flow disturbance. The corresponding sampling ports should be 90 degrees apart from each other.</p>
	<p>4. The Permittee shall monitor the daily, monthly, and twelve month rolling biogas and natural gas consumption as well as the electrical output for EU 18 and EU 19.</p>
	<p>5. The Permittee shall continuously monitor the hydrogen sulfide concentration (in ppm by volume) of the biogas after H₂S control by PCD-4 that is combusted in either EU 18 or EU 19.</p>
	<p>6. The Permittee shall monitor to ensure that an adequate supply of spare parts is maintained, as recommended by manufacturer(s), on-site to maintain the air pollution control systems and monitoring equipment serving EU 18 and EU 19.</p>
	<p>7. The Permittee shall equip EU 18 and EU 19 with an hour meter and recorder and all periods of usage shall be monitored.</p>
	<p>8. The Permittee shall install and operate continuous sensors and alarm systems to monitor the operating parameters for each SCR (i.e., temperature) and each Oxidation Catalyst.</p>

Table 3	
EU#	Monitoring and Testing Requirements
EU 17	9. The Permittee shall conduct emissions testing for NO _x , CO, VOC, and CO ₂ within 90 days of the commencement of continuous operation of the engines. All compliance testing shall be conducted in accordance with the test methods and procedures set forth in 40 CFR 60, Appendix A. All compliance testing shall be witnessed by MassDEP personnel at a mutually agreeable date and time. The Permittee shall submit a test protocol for the required emission test for review and MassDEP approval at least 30 days prior to the anticipated date of testing. The Permittee shall submit the emission test results report to MassDEP's NERO within 60 days of completion of the compliance stack testing.
	10. The Permittee shall submit the plans and locations of the downstream thermocouple that will be used to measure to operation of EU 17 as well as the sampling ports for this emission unit. This information shall be submitted for MassDEP approval prior to the submittal of the test protocol in paragraph 9 above.
EU 11 EU 17	11. The Permittee shall monitor the daily, monthly, and twelve month rolling biogas consumption for EU 11 and EU 17.
	12. The Permittee shall monitor the operating temperature of each emission unit (as measured by the downstream thermocouple).
EU 20 EU 21	13. The Permittee shall monitor daily the amount of SSO (i.e. gallons, pounds, etc.) that these emission units receive.
	14. The Permittee shall observe the biofilter on a daily basis to ensure that no associated odors are being generated from these emission units.
EU 22 EU 23 EU 24 EU 25	15. The Permittee shall monitor the H ₂ S concentration at the combined header leaving these anaerobic digesters.
EU 1 EU 2 EU 3	16. The Permittee shall monitor the monthly and rolling 12 month period consumption of digester gas and natural gas in the digester boilers.
EU4 EU5	17. The Permittee shall monitor the monthly and rolling 12-month period consumption of digester gas and natural gas in these emission units.
	18. The Permittee shall monitor the monthly and rolling 12-month period transfer rates of dry tons of digested biosolids into the two rotary drum dryers.
	19. The Permittee shall conduct additional compliance air emissions testing of these two EUs every five (5) years. Testing for arsenic and cadmium shall be included in this air emissions testing.

Table 3	
EU#	Monitoring and Testing Requirements
EU4 EU5	20. The Permittee shall submit a pre-test protocol to this Office, attention Permit Chief Bureau of Air and Waste, for review and written Department approval at least 60 days prior to the proposed testing. The pre-test protocol shall describe sampling for oxygen (to be used as reference gas), and all pollutants contained in Table 2, as required under 40 CFR Part 60, Appendix A. The pre-test protocol shall also describe point locations, sampling equipment, sampling and analytical procedures, quality assurance procedures, and the operating conditions for the required test. Department personnel must witness all compliance testing. Scheduling for the requisite emissions compliance testing shall be coordinated with Department personnel availability and shall be confirmed no later than 30 days prior to the target test date(s). At least 60 days prior to stack testing, the Permittee shall submit a copy of this pre-test protocol to the North Andover Board of Health.
	21. The Permittee shall allow the North Andover Board of Health to send a qualified professional to observe any Department required stack testing at the Biosolids Drying Facility, provided that GLSD has been so informed at least thirty (30) days prior to the testing and provided that said qualified professional does not have a conflict of interest with GLSD.
	22. The Permittee shall utilize a daily chart recorder, or equivalent, to demonstrate that each RTO maintains a minimum operating temperature of 1600°F, exclusive of start-up/shut-down modes, and that a thermocouple be placed to continuously record the temperature of the exhaust gases in the combustion zone of each unit.
	23. The Permittee shall comply with the requirements of 40 CMR 503 in regards to bimonthly testing of the sludge.
	24. The Permittee shall continuously monitor the pressure drop through the tray scrubber and the pressure drop through the venturi scrubber associated with the biosolids drying facility.
EU 8	25. The Permittee shall monitor fuel oil purchases such that only fuel oil containing ≤ 500 ppm Sulfur content through June 30, 2018 and ≤ 15 ppm Sulfur content on and after July 1, 2018 is purchased for use in this emission unit.
Facility-wide	26. The Permittee shall monitor all periods of excess emissions from the facility, even if attributable to an emergency/malfunction or start up/shutdown. Said excess emissions shall be quantified and included by the Permittee in the determination of and compliance with the emission limitations as stated in this Approval. ("Excess Emissions" are defined as emissions, which are in excess of the short-term emission limitations as stipulated in Table 2 of this Approval.)
	27. The Permittee shall monitor all operations to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	28. If and when MassDEP requires it, the Permittee shall conduct emission testing in accordance with USEPA Reference Test Methods and Regulation 310 CMR 7.13.
	29. At least 30 days prior to emission testing, the Permittee shall submit to MassDEP for approval a stack emission pretest protocol.
	30. Within 45 days after emission testing, the Permittee shall submit to MassDEP a final stack emission test results report.

Table 3 Key:

EU# = Emission Unit Number
 EU = emission unit
 EUs = emission units
 NO_x = Nitrogen Oxides
 CO = Carbon Monoxide
 H₂S = Hydrogen Sulfide
 SO₂ = Sulfur Dioxide
 PM = Total Particulate matter including PM₁₀ and PM_{2.5}
 PM₁₀ = Particulate matter having a particle size less than or equal to 10 microns
 PM_{2.5} = Particulate matter having a particle size less than or equal to 2.5 microns
 VOC = Volatile Organic Compounds
 NH₃ = Ammonia
 CO₂ = Carbon Dioxide
 USEPA = United States Environmental Protection Agency
 MassDEP = Massachusetts Department of Environmental Protection
 CFR = Code of Federal Regulations
 CMR = Code of Massachusetts Regulations
 O₂ = Oxygen
 ppm = parts per million
 ppmv = parts per million by volume
 SSO = source separated organics (i.e. food waste)
 °F = degrees Fahrenheit
 PCD = Pollution Control Device
 SOMP = Standard Operating and Maintenance Procedures
 BAW = Bureau of Air and Waste

Table 4	
EU#	Record Keeping Requirements
EU 18 EU 19	1. The Permittee shall compile startup and shutdown emissions data for NO _x and CO to be used to determine the proposed startup and shutdown emission limits and durations for EU 18 and EU 19. Emissions data generated from this compilation shall be submitted for review by MassDEP prior to determining and approving the maximum allowable emissions, for these periods of time. Please see Table 5 below for associated reporting requirements.
	2. The Permittee shall maintain monthly logs of hours of operation, quantity of fuel used, and heating value of the fuel. A monthly calculation of both the total hours operated and fuel used in the previous twelve months shall be kept onsite for a minimum of five years and shall be made available to MassDEP personnel upon request. The Permittee shall maintain records of purchase orders, invoices and other documents to support information in the monthly log as well as certificates and documents from the manufacturer related to certificates.
	3. The Permittee shall maintain daily on-site records of the maximum, minimum, and average H ₂ S concentrations (in ppm by volume) exiting the Iron Sponge H ₂ S removal system (PCD-4) before the biogas is combusted in either EU 18 or EU 19.

Table 4	
EU#	Record Keeping Requirements
EU 11 EU 17	4. The Permittee shall record the daily, monthly, and twelve month rolling biogas consumption for EU 11 and EU 17.
	5. The operating temperatures shall be continuously recorded on a daily circular charts, or equivalent, by utilizing the downstream thermocouple.
	6. The Permittee shall maintain the required operating temperature records for these enclosed flares.
EU 20 EU 21	7. The Permittee shall maintain daily records on-site of the amount of SSO that these emission units receive.
	8. The Permittee personnel shall record the date, time, and delivery amount of SSO in a logbook, or similar record keeping system, that shall be maintained near these emission units.
	9. The Permittee shall maintain weekly records on-site on the condition of the biofilter.
EU1 EU 2 EU 3	10. The Permittee shall maintain on-site records documenting the monthly and rolling 12 month period consumption of digester gas and natural gas in the digester boilers.
	11. The Permittee shall maintain records documenting that only two of these three emission units are operating at any given time.
EU4 EU5	12. The Permittee shall maintain on-site records documenting the monthly and rolling 12-month period consumption of digester gas and natural gas in these EUs. (See attached On-site Record-keeping Form.)
	13. The Permittee shall maintain on-site records documenting the monthly and rolling 12-month period transfer rates of dry tons of digested biosolids into the two rotary drum dryers.
	14. The Permittee shall maintain daily records to demonstrate that each RTO maintains a minimum operating temperature of 1600°F, exclusive of start-up/shut-down modes.
EU 8	15. The Permittee shall maintain oil analysis results, fuel oil receipts, or other documentation to demonstrate compliance with fuel oil sulfur content requirements.
Facility-wide	16. The Permittee shall quantify all periods of excess emissions, even if attributable to an emergency/malfunction, startup/shutdown or equipment cleaning in the determination of annual emissions.
	17. The Permittee shall maintain adequate records on-site to demonstrate compliance status with all operational, production, and emission limits contained in Table 2 above. Records shall also include the actual emissions of air contaminant(s) emitted for each calendar month and for each consecutive twelve-month period (current month plus prior eleven months). These records shall be compiled no later than the 15 th day following each month. An electronic version of the MassDEP approved record keeping form, in Microsoft Excel format, can be downloaded at http://www.mass.gov/eea/agencies/massdep/air/approvals/limited-emissions-record-keeping-and-reporting.html#WorkbookforReportingOn-SiteRecordKeeping .
	18. The Permittee shall maintain records of monitoring and testing as required by Table 3.

Table 4	
EU#	Record Keeping Requirements
Facility-wide	19. The Permittee shall maintain a copy of this Plan Approval, underlying Application and the most up-to-date SOMP for the EU(s) and PCD(s) approved herein on-site.
	20. The Permittee shall maintain a record of routine maintenance activities performed on the approved EU(s), PCD(s) and monitoring equipment. The records shall include, at a minimum, the type or a description of the maintenance performed and the date and time the work was completed.
	21. The Permittee shall maintain a record of all malfunctions affecting air contaminant emission rates on the approved EU(s), PCD(s), and monitoring equipment. At a minimum, the records shall include: date and time the malfunction occurred; description of the malfunction; corrective actions taken; the date and time corrective actions were initiated and completed; and the date and time emission rates and monitoring equipment returned to compliant operation.
	22. The Permittee shall maintain records to ensure sufficient information is available to comply with 310 CMR 7.12 Source Registration.
	23. The Permittee shall maintain records required by this Plan Approval on-site for a minimum of five (5) years.
	24. The Permittee shall make records required by this Plan Approval available to MassDEP and USEPA personnel upon request.

Table 4 Key:

EU # = Emission Unit Number
 NO_x = Nitrogen Oxides
 CO = Carbon Monoxide
 H₂S = Hydrogen Sulfide
 USEPA = United States Environmental Protection Agency
 MassDEP = Massachusetts Department of Environmental Protection
 PCD = Pollution Control Device
 SOMP = Standard Operating and Maintenance Procedures
 SSO = source separated organics
 ppm = parts per million
 CMR = Code of Massachusetts Regulations
 RTO = regenerative thermal oxidizer
 °F = degrees Fahrenheit

Table 5	
EU#	Reporting Requirements
EU 18 EU 19	1. The Permittee shall submit a test protocol, describing the test methods for NO _x , CO, VOC, PM, SO ₂ , CO ₂ , and NH ₃ initial compliance testing and procedures for NO _x , CO, VOC, PM, SO ₂ , and NH ₃ optimization/minimization, sampling point locations, sampling equipment, sampling and analytical procedures, and the operating conditions for the required testing to this Office, attention Bureau of Air and Waste Permit Chief, for review and MassDEP approval at least 30 days prior to the commencement of the initial compliance testing for the subject EUs.
	2. The Permittee shall submit the initial emission test results report to NERO for review within 60 days of the completion of any required compliance stack testing.
	3. The Permittee shall ensure that the results of the conducted noise survey required in Table 3 above shall be submitted to this Office, in writing, attention Permit Chief, Bureau of Air and Waste, within 60 days of the commencement of continuous operation of the subject equipment.
	4. The Permittee shall submit to MassDEP the startup and shutdown emissions data for NO _x and CO to be used to determine the startup and shutdown emission limits for EU 18 and EU 19. The Permittee shall submit emission data including proposed emission limits and durations for startup and shutdown to MassDEP within twelve (12) months of commencement of continuous operation of the engines. MassDEP will incorporate these limits into an Approval for EU 18 and EU 19 startup and shutdown emission limits and, upon issuance, said limits during such times shall be considered enforceable.
	5. The Permittee shall submit the Final SOMP concerning the subject equipment to this Office, attention Permit Chief, Bureau of Air and Waste, within ninety (90) days of continuous operation of these two EUs. The Final SOMP shall include standard operating and maintenance procedures for EU 18 and EU 19, and each associated SCR and Oxidation Catalyst.
	6. The Permittee shall submit any subsequent revision(s) made to the Final SOMP concerning the subject equipment, to this Office, attention Permit Chief, Bureau of Air and Waste, within 15 days of said revision(s).
EU 22 EU 23 EU 24 EU 25	7. The Permittee shall notify MassDEP's NERO, ATTN: BAW Permit Chief, within three (3) business days by fax at (978) 694-3499 of any exceedances of the H ₂ S emission limit found in Table 2 above. In the same manner, the Permittee shall notify MassDEP whenever the H ₂ S gas monitoring probe is offline and again when it is back on-line.
EU 4 EU 5	8. The Permittee shall submit an annual report to this Office by March 15 of each year containing the estimated emission rates for the previous calendar year, both monthly and running 12-month totals, for each of the following air contaminants: NO _x , SO ₂ , PM, VOC, and CO. (See attached Annual Report Form.)

Table 5	
EU#	Reporting Requirements
	9. The Permittee shall submit a complete air emissions compliance testing results report to this Office, attention Permit Chief, Bureau of Waste Prevention, within 60 days after completion of said testing for review and written Department Approval.
EU 4 EU 5	10. The Permittee shall submit any revisions of the Sludge Monitoring Protocol to the North Andover Board of Health within 60 days of the revision.
	11. The Permittee shall submit copies of the any revised Final Standard Operating and Maintenance Procedures for the biosolids drying facility to MassDEP and to the North Andover Board of Health within sixty (60) days after any revision.
Facility-wide	12. The Permittee shall submit to MassDEP all information required by this Plan Approval over the signature of a "Responsible Official" as defined in 310 CMR 7.00 and shall include the Certification statement as provided in 310 CMR 7.01(2)(c).
	13. The Permittee shall notify the Northeast Regional Office of MassDEP, BAW Permit Chief by telephone: 978-694-3200, email: NERO.Air@massmail.state.ma.us, or fax : 978-694-3499, as soon as possible, but no later than three (3) business day after discovery of an exceedance(s) of Table 2 requirements. A written report shall be submitted Permit Chief at MassDEP within ten (10) business days thereafter and shall include: identification of exceedance(s), duration of exceedance(s), reason for the exceedance(s), corrective actions taken, and action plan to prevent future exceedance(s).
	14. The Permittee shall report annually to MassDEP, in accordance with 310 CMR 7.12, all information as required by the Source Registration/Emission Statement Form. The Permittee shall note therein any minor changes (under 310 CMR 7.02(2)(e), 7.03, 7.26, etc.), which did not require Plan Approval.
	15. The Permittee shall, by March 15 th of each year, submit an Annual Emissions Report to this Office containing the actual emissions rates in tons, on both a monthly and consecutive twelve month time period. The MassDEP approved Report Form in Microsoft Excel format can be downloaded at http://www.mass.gov/dep/air/approvals/aqforms.htm#report .
	16. In accordance with 310 CMR 7.71(5), by April 15 th of each year report emissions of greenhouse gases from stationary emissions sources including, but not limited to, emissions from factory stacks, manufacturing processes and vents, fugitive emissions, and other process emissions; and owned or leased motor vehicles when stationary source greenhouse gas emissions are greater than 5,000 short ton CO _{2e} . Report greenhouse gas emission electronically in a format that can be accommodated by the registry.
	17. In accordance with 310 CMR 7.71(6), certify greenhouse gas emissions reports using a form provided by the Department or the registry.
	18. In accordance with 310 CMR 7.71(7), by December 31 st of the applicable year submit to the Department documentation of triennial verification of the greenhouse gas emissions reports.
	19. The Permittee shall provide a copy to MassDEP of any record required to be maintained by this Plan Approval within 30 days from MassDEP's written request.

Table 5 Key:

EU # = Emission Unit Number
 EU = emission unit
 NO_x = Nitrogen Oxides
 CO = Carbon Monoxide
 CO₂ = Carbon Dioxide
 SO₂ = Sulfur Dioxide
 PM_{2.5} = Particulate matter having a particle size less than or equal to 2.5 microns
 PM₁₀ = Particulate matter having a particle size less than or equal to 10 microns
 PM = Total Particulate matter including PM₁₀ and PM_{2.5}
 VOC = Volatile Organic Compounds
 NH₃ = Ammonia
 H₂S = Hydrogen Sulfide
 USEPA = United States Environmental Protection Agency
 MassDEP = Massachusetts Department of Environmental Protection
 NERO = Northeast Regional Office
 BAW = Bureau of Air and Waste
 PCD = Pollution Control Device
 SCR = Selective Catalytic Reduction
 SOMP = Standard Operating and Maintenance Procedures
 SSO = source separated organics
 ppm = parts per million
 CFR = Code of Federal Regulations
 CMR = Code of Massachusetts Regulations
 RTO = regenerative thermal oxidizer
 °F = degrees Fahrenheit
 CO_{2e} = Carbon dioxide equivalents

4. **SPECIAL TERMS AND CONDITIONS**

- A. The Permittee is subject to, and shall comply with, the Special Terms and Conditions as contained in Table 6 below:

Table 6	
EU#	Special Terms and Conditions
EU 18 EU 19	1. EU 18 and EU 19 shall each be equipped with a silencer having a minimum dynamic insertion loss (DIL) in the range of 25 – 30 decibels, A-weighted (dBA). In addition, the Permittee shall install acoustic noise suppression equipment to minimize noise and the potential of a pure tone condition.
	2. The Permittee shall ensure each SCR system (PCD-1A and/or PCD-1B) and each OC system (PCD-2A and/or PCD-2B) operate whenever its associated engine is operated, including start-up and shutdown, except that the SCR systems shall be placed in operation only after the exhaust gas temperature across SCR unit reaches approximately 540°F.

Table 6	
EU#	Special Terms and Conditions
EU 18 EU 19	3. The Permittee shall ensure each SCR system (PCD-1A and PCD-1B) reduce NO _x emissions by approximately 98% by weight.
	4. The Permittee shall ensure each OC system (PCD-2A and PCD-2B) reduce VOC and CO emissions by approximately 50% and 96% by weight, respectively.
	5. The Permittee shall ensure that each engine shall comply with all applicable requirements of 40 CFR Part 60, New Source Performance Standards, Subpart JJJJ and with all applicable requirements of 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants, Subpart ZZZZ.
	6. The Permittee shall ensure that biogas and natural gas shall be the only fuels of use in these engines.
	7. The Permittee shall ensure that startups and shutdowns are conducted as per manufacturer specifications.
	8. The Permittee shall operate the subject equipment consistent with the Final Standard Operating and Maintenance Procedures ("SOMP") and the conditions/parameters established during the compliance test program.
	9. The Permittee shall provide the Northeast Regional Office with the final plans, specifications, and SOMP for the SCR systems, the OC systems, the Iron Sponge H ₂ S removal system, the siloxane scrubbers (if needed to protect the engines, the SCR catalysts, and the OC catalysts), and the particulate filter within ninety (90) days of continuous operation of these two CHP engines.
EU 20 EU 21	10. The Permittee shall properly operate and maintain the biofilter for the purpose of controlling odors from material handling and processing in these emission units.
EU 22 EU 23 EU 24 EU 25	11. The Permittee shall properly operate and maintain PCD-4 for the purpose of maintaining the H ₂ S concentration at or below 5 parts per million by volume (ppmv) prior to the combustion of the biogas in EU 18 and EU 19.
	12. The Permittee shall ensure that the iron sponge media in PCD-4 shall be replaced when the discharge H ₂ S concentration approaches 5 ppmv or after two years of media life, whichever occurs first.
EU 1 EU 2 EU 3	13. The Permittee shall not exceed the following monthly or rolling 12-month total fuel caps: a) Monthly maximum use of the combination of natural gas fuel and biogas fuel of 17,160,000 cubic feet, and b) Rolling 12 month period maximum use of the combination of natural gas fuel and biogas fuel of 106,900,000 cubic feet.
	14. The Permittee shall only operate two of these emission units at any given time, with the third unit acting as a standby unit.
EU 4 EU 5	15. The Permittee shall ensure that each RTO (PCD-10 and PCD-11) shall achieve a minimum thermal destruction efficiency for VOC of 98.0 percent by weight as well as 90.5 percent by weight for CO.
	16. The Permittee shall not exceed the following monthly or rolling 12-month total biogas fuel caps for the process trains (inclusive of the rotary drum dryers and the RTOs): a) Monthly maximum use of biogas fuel of 25,143,000 cubic feet, and b) Rolling 12 month period maximum use of biogas fuel of 301,500,000 cubic feet.

Table 6	
EU#	Special Terms and Conditions
EU 4 EU 5	<p>17. The Permittee shall not exceed the following monthly or rolling 12-month total natural gas fuel caps for the process trains (inclusive of the rotary drum dryers and the RTOs):</p> <ul style="list-style-type: none"> a) Monthly maximum use of natural gas fuel of 15,087,000 cubic feet, and b) Rolling 12 month period maximum use of natural gas fuel of 180,930,000 cubic feet.
	<p>18. The Permittee shall not exceed the following monthly or rolling 12-month total fuel caps on the combination of natural gas and biogas for the process trains (inclusive of the rotary drum dryers and the RTOs):</p> <ul style="list-style-type: none"> a) Monthly maximum use of the combination of natural gas fuel and biogas fuel of 25,143,000 cubic feet, and b) Rolling 12 month period maximum use of the combination of natural gas fuel and biogas fuel of 301,500,000 cubic feet.
	<p>19. The Permittee shall not exceed the following monthly or rolling 12-month total transfer rates of dry tons of feed digested biosolids into the two rotary drum dryer trains:</p> <ul style="list-style-type: none"> a) Monthly maximum transfer rate of dry tons of feed digested biosolids into the two rotary drum dryer trains of 1,178 tons, and b) Rolling 12 month period maximum transfer rate of dry tons of feed digested biosolids into the two rotary drum dryer trains of 13,870 tons.
	<p>20. The Permittee shall calculate emission rate factors for arsenic and cadmium based on the results of performance testing of the biosolid processing facility. GLSD shall submit the calculated emission rate factors to MassDEP for review and approval.</p> <p>Utilizing the approved emission rate factors for arsenic and cadmium, the required bimonthly 40 CFR 503 sludge analysis and the number of dryers in operation, GLSD shall on at least a bi-monthly basis, determine the emissions of arsenic and cadmium. The calculated dryer emissions shall be compared to the action levels of arsenic and cadmium identified below.</p> <p>If the measured arsenic content of the sludge corresponds with an arsenic emission rate in excess of 5.68×10^{-5} pounds per hour, and/or if the measured cadmium content of the sludge corresponds with a cadmium emission rate of 3.59×10^{-4} pounds per hour, GLSD shall notify the Department within 72 hours of making such determination. At its discretion, GLSD may take an additional arsenic and cadmium sample of the sludge within the following 30-day period and notify the Department of the supplemental test results.</p> <p>If the measured arsenic content of the sludge corresponds with an arsenic emission rate in excess of 7.58×10^{-5} pounds per hour, and/or if the measured cadmium content of the sludge corresponds with a cadmium emission rate of 4.79×10^{-4} pounds per hour, GLSD shall within 72 hours of making such determination notify the Department. In addition, GLSD shall take two additional arsenic and cadmium samples of the sludge within the following 30-day period. If the results of these supplemental tests continue to show an arsenic or cadmium emission rate in excess of these action levels, GLSD shall take corrective action to reduce the emissions from the exhaust stacks below that action level or levels. GLSD shall notify the Department regarding the corrective actions it has taken.</p> <p>A copy of all notifications submitted to the Department pursuant to this Special Condition No. 21 shall be sent at the same time to all members of the GLSD Board of Directors.</p>
EU 11	<p>21. The Permittee shall not exceed the maximum usage of 258,720,000 cubic feet of biogas over any rolling 12-month period for the back-up enclosed flare.</p>

Table 6	
EU#	Special Terms and Conditions
EU 11	22. This enclosed flare shall provide a minimum thermal destruction efficiency of 99 percent by weight for VOC or a maximum VOC outlet concentration of 20 ppmv (as hexane) at 3 percent oxygen.
	23. This enclosed flare shall automatically maintain its minimum operating temperature of 1600°F while biogas is being combusted.
EU 11 EU 17	24. GLSD may choose to demonstrate during compliance testing of the flare that a minimum operating temperature of less than 1600°F can also meet the required thermal destruction efficiency or maximum VOC outlet concentration.
EU 17	25. This enclosed flare shall provide a minimum thermal destruction efficiency of 99 percent by weight for VOC.
Facility-wide	26. This Plan Approval shall supersede the MODIFIED Conditional Approval, Transmittal No. W009400, issued to the Permittee on September 13, 2001, and Conditional Approval, Transmittal No. W002567, issued to the Permittee on March 18, 1999, in their entirety, with the exception that all plan application materials submitted as part of the Plan Approvals for Transmittal Nos. W009400 and W002567 become part of this Plan Approval, Tr. No. X268418.
	27. The Permittee shall submit a standard operation and maintenance plan (SOMP) for the SCR system, the oxidation catalyst system, iron sponge hydrogen sulfide removal system, and the siloxane scrubbers (if needed to protect the engines and catalyst systems) to MassDEP's NERO, ATTN: BAW Permit Chief within ninety (90) days of continuous operation of the two engines. This plan shall be implemented and followed immediately upon startup of the Facility and, at a minimum, include the following information: <ul style="list-style-type: none"> i. A description of each system, including materials of construction and key operating parameter value(s) or range(s); ii. A description of how each said system shall be operated and maintained, including a schedule for routine maintenance and material replacement, equipment specifications of the system's odorous air blower, and dimensions and location of each system; iii. A description of how each system's key operating parameters shall be monitored and corrective actions performed if any key operating parameter(s) fall outside its (their) expected value(s) or range(s); iv. A description of any periodic sampling or testing performed on each system and emissions exiting it for odor-causing compounds; and v. A description of how any system malfunctions shall be reported to the MassDEP.
	28. This Facility may be subject to the Federal New Source Performance Standards (NSPS) for Stationary Spark Ignition Internal Combustion Engines (40 CFR Part 60 Subpart JJJJ). Since MassDEP has not accepted delegation for Subpart JJJJ, you are advised to consult with the EPA for additional information. There may be additional notification, record keeping and reporting requirements. Their address is US EPA Region 1, 5 Post Office Square – Suite 100, Boston, MA 02109-3912.

Table 6	
EU#	Special Terms and Conditions
Facility-wide	29. This Facility may be subject to the Federal National Emissions Standards for Hazardous Air Pollutants (NESHAPs) for Stationary Reciprocating Internal Combustion Engines (RICE) under 40 CFR Part 63 Subpart ZZZZ. This regulation includes stationary RICE units at an area source. Since MassDEP has not accepted delegation for Subpart ZZZZ, you are advised to consult with the United States Environmental Protection Agency (USEPA) for additional information. There may be additional notification, record keeping and reporting requirements. Their address is US EPA Region 1, 5 Post Office Square – Suite 100, Boston, MA 02109-3912.

Table 6 Key:

EU# = Emission Unit Number	EUs = emission units
CMR = Code of Massachusetts Regulations	NO _x = Nitrogen Oxides
°F = degrees Fahrenheit	SO ₂ = Sulfur Dioxide
CFR = Code of Federal Regulations	OC = oxidation catalyst
PM = Total Particulate Matter including PM ₁₀ and PM _{2.5}	PM ₁₀ = Particulate Matter less than or equal to 10 microns in diameter
PM _{2.5} = Particulate Matter less than or equal to 2.5 microns in diameter	VOC = Volatile Organic Compounds
H ₂ S = Hydrogen Sulfide	SCR = selective catalytic reduction
CO = Carbon Monoxide	HAP (total) = total Hazardous Air Pollutants.
CO ₂ = Carbon Dioxide	TPM = tons per month
TPY = tons per consecutive 12-month period	RTO = regenerative thermal oxidizer
GLSD = Greater Lawrence Sanitary District	ppmv = parts per million by volume
MassDEP = Massachusetts Department of Environmental Protection	PCD = pollution control device
	BAW = Bureau of Air and Waste
	NERO = Northeast Regional Office

- B. The Permittee shall install and use an exhaust stack, as required in Table 7, on each of the Emission Units that is consistent with good air pollution control engineering practice and that discharges so as to not cause or contribute to a condition of air pollution. Each exhaust stack shall be configured to discharge the gases vertically and shall not be equipped with any part or device that restricts the vertical exhaust flow of the emitted gases, including, but not limited to, rain protection devices known as “shanty caps” and “egg beaters.”
- C. The Permittee shall install and utilize exhaust stacks with the following parameters, as contained in Table 7, for the Emission Units that are regulated by this Plan Approval:

Table 7				
EU#	Stack Height Above Ground (feet)	Stack Inside Exit Dimensions (feet)	Stack Gas Exit Velocity (feet per second)	Stack Gas Exit Temperature (°F)
EU 1, EU 2, EU 3	56.5	1.33	33.6	350
EU 4	98.2	1.5	46.6	200 to 400
EU 5	98.2	1.5	46.6	200 to 400
EU 8	18.5	0.30	10.0	1500
EU 11	50	5.27	32.0	1600
EU 12	63	1.25	42.0	350
EU 13	63	1.25	42.0	350
EU 15 EU 16	63	0.55	42.0	368
EU 17	31	9.13	20.3	800
EU 18	30.8	1.67	46.6	300
EU 19	30.8	1.67	46.6	300

Table 7 Key:

EU # = Emission Unit Number

°F = Degree Fahrenheit

5. GENERAL CONDITIONS

The Permittee is subject to, and shall comply with, the following general conditions:

- A. Pursuant to 310 CMR 7.01, 7.02, 7.09 and 7.10, should any nuisance condition(s), including but not limited to smoke, dust, odor or noise, occur as the result of the operation of the Facility, then the Permittee shall immediately take appropriate steps including shutdown, if necessary, to abate said nuisance condition(s).
- B. If asbestos remediation/removal will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that all removal/remediation of asbestos shall be done in accordance with 310 CMR 7.15 in its entirety and 310 CMR 4.00.

- C. If construction or demolition of an industrial, commercial or institutional building will occur as a result of the approved construction, reconstruction, or alteration of this Facility, the Permittee shall ensure that said construction or demolition shall be done in accordance with 310 CMR 7.09(2) and 310 CMR 4.00.
- D. Pursuant to 310 CMR 7.01(2)(b) and 7.02(7)(b), the Permittee shall allow MassDEP and / or USEPA personnel access to the Facility, buildings, and all pertinent records for the purpose of making inspections and surveys, collecting samples, obtaining data, and reviewing records.
- E. This Plan Approval does not negate the responsibility of the Permittee to comply with any other applicable Federal, State, or local regulations now or in the future.
- F. Should there be any differences between the Application and this Plan Approval, the Plan Approval shall govern.
- G. Pursuant to 310 CMR 7.02(3)(k), MassDEP may revoke this Plan Approval if the construction work is not commenced within two years from the date of issuance of this Plan Approval, or if the construction work is suspended for one year or more.
- H. This Plan Approval may be suspended, modified, or revoked by MassDEP if MassDEP determines that any condition or part of this Plan Approval is being violated.
- I. This Plan Approval may be modified or amended when in the opinion of MassDEP such is necessary or appropriate to clarify the Plan Approval conditions or after consideration of a written request by the Permittee to amend the Plan Approval conditions.
- J. Pursuant to 310 CMR 7.01(3) and 7.02(3)(f), the Permittee shall comply with all conditions contained in this Plan Approval. Should there be any differences between provisions contained in the General Conditions and provisions contained elsewhere in the Plan Approval, the latter shall govern.

6. MASSACHUSETTS ENVIRONMENTAL POLICY ACT

MassDEP has determined that the filing of an Environmental Notification Form (ENF) with the Secretary of Energy & Environmental Affairs, for air quality control purposes, was not required prior to this action by MassDEP. Notwithstanding this determination, the Massachusetts Environmental Policy Act (MEPA) and 301 CMR 11.00, Section 11.04, provide certain “Fail-Safe Provisions,” which allow the Secretary to require the filing of an ENF and/or an Environmental Impact Report (EIR) at a later time.

7. APPEAL PROCESS

This Plan Approval is an action of MassDEP. If you are aggrieved by this action, you may request an adjudicatory hearing. A request for a hearing must be made in writing and postmarked within twenty-one (21) days of the date of issuance of this Plan Approval.

Under 310 CMR 1.01(6)(b), the request must state clearly and concisely the facts, which are the grounds for the request, and the relief sought. Additionally, the request must state why the Plan Approval is not consistent with applicable laws and regulations.

The hearing request along with a valid check payable to the Commonwealth of Massachusetts in the amount of one hundred dollars (\$100.00) must be mailed to:

Commonwealth of Massachusetts
Department of Environmental Protection
P.O. Box 4062
Boston, MA 02211

This request will be dismissed if the filing fee is not paid, unless the appellant is exempt or granted a waiver as described below. The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority.

MassDEP may waive the adjudicatory hearing-filing fee for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file, together with the hearing request as provided above, an affidavit setting forth the facts believed to support the claim of undue financial hardship.

Should you have any questions concerning this Plan Approval, please contact Mr. Mun Wong by telephone at 978-694-3286, or in writing at the letterhead address.

Sincerely,

This final document copy is being provided to you electronically by the
Department of Environmental Protection. A signed copy of this document
is on file at the DEP office listed on the letterhead.

Mun S. Wong
Environmental Engineer

This final document copy is being provided to you electronically by the
Department of Environmental Protection. A signed copy of this document
is on file at the DEP office listed on the letterhead.

Edward J. Braczyk
Environmental Engineer

This final document copy is being provided to you electronically by the
Department of Environmental Protection. A signed copy of this document
is on file at the DEP office listed on the letterhead.

Susan P. Ruch
Deputy Regional Director
and Acting Permit Chief
Bureau of Air and Waste

cc: Board of Health, 1600 Osgood Street, Building 20, Unit 2035, North Andover, MA 01845
Fire Headquarters, 795 Chickering Road, North Andover, MA 01845
CDM Smith, 75 State Street, Suite 701, Boston, MA 02109 ATTN: Ms. Cynthia Hibbard

ecc: MassDEP/Boston - Yi Tian
MassDEP/NERO – E. Braczyk, M. Bolis, M. Persky